NOISE ELEMENT
AND
ENVIRONMENTAL IMPACT REPORT

SECTION NINE
of the
GENERAL PLAN
for
SACRAMENTO, CALIFORNIA

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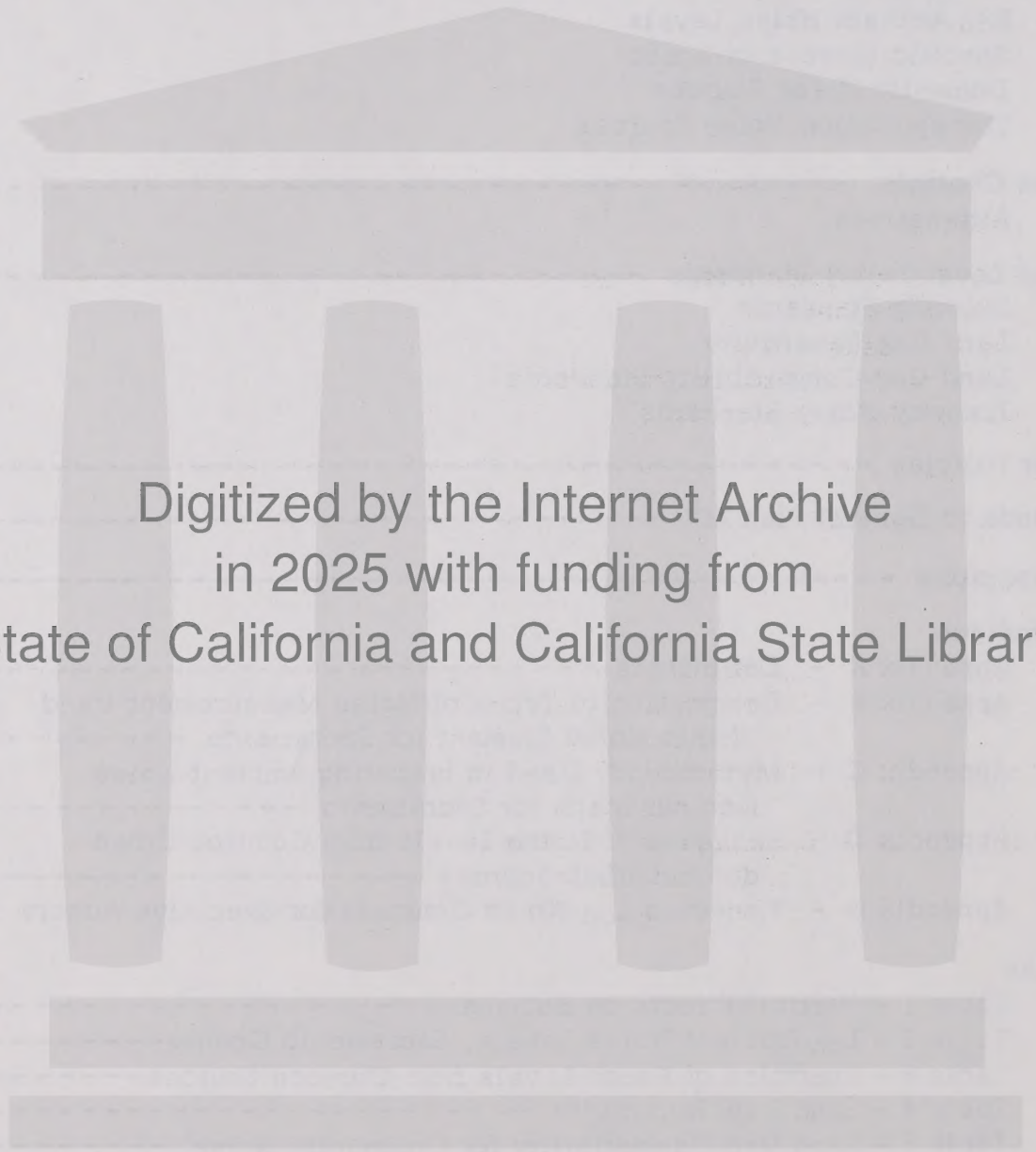
TABLE OF CONTENTS



NOISE ELEMENT

GOAL

Ensure the health, safety and welfare of Sacramento's residents and users, and endeavor to provide an environment which is free of unnecessary and annoying noise.

This should be done by:

1 - Establishing acceptable levels of noise by land use categories;

2 - Reducing noise wherever it exceeds the designated ambient level for that particular land use category;

3 - Ensuring that sound transmitted across parcel boundaries is limited to the level permitted within the receiving area;

4 - Limiting truck traffic, and its noise, to designated routes outside residential areas wherever possible;

5 - Designing major traffic thoroughfares wherever possible in such a manner as to reduce noise generated by them; and by

6 - Actively encouraging those governmental agencies with primary responsibility for reducing noise to take appropriate action.

INTRODUCTION

Purpose. The purpose of this element of the General Plan is to provide an understanding of noise problems in this City and to recommend policy statements which identify measures to correct these problems so that Sacramento can improve the quality of its environment. This noise element is also deemed to fulfill the mandatory element provisions as setforth in California Government Code Section 65302(g).

The Phenomenon of Noise. Noise can be defined as unwanted sound. It is often difficult to objectively describe since what is a desirable sound to one person is noise to another. A particular selection of music for example evokes this characteristic many times, being pleasant to one person but irritating to another. The same music played after midnight, however, may be unbearable to both. The duration, time of day, pitch, frequency and intensity of a sound all contribute to its being defined as desirable or undesirable. There are, however, many sounds which are categorized as noise by nearly everyone. This element is concerned primarily with these sounds.

Until recently, noise was tolerated as an inevitable consequence of twentieth century progress, particularly in urbanized centers throughout the world where the ambient or background noise levels have increased steadily. Sources of such noise are in large part man-made; the majority of it from airplanes, trains, trucks, cars and motorcycles. Added to the transportation sources are significant amounts from manufacturing, construction, and domestic activities.

While noise pollution does not yet have the attention that other environmental concerns such as air and water pollution have, popular interest and concern is gradually increasing. There is substantial clinical data to support the adverse effects of noise on the human being. There is also an expanding list of existing and proposed noise level standards. Much of the work that needs to be done to correct the noise problem in urban communities, however, is either not technologically or economically feasible at this time or is pre-empted by other than local governmental agencies. The City of Sacramento recognizes these limitations, however, it is believed that there are reasonable measures which can be currently utilized to improve the present environment until such time as more comprehensive measures become feasible.

The Effects of Noise. It has long been known that prolonged exposure to high levels of sound can produce permanent hearing loss. What is less known but nevertheless very important is that more subtle physiological, psychological, social and economic effects occur which are directly or indirectly detrimental to humans.

The most significant and obvious harmful physiological effect is permanent loss of hearing as mentioned above. In a report on noise to the President and Congress in 1971, the Environmental Protection Agency stated that some 40 million Americans are regularly exposed to hazardous levels of noise, and the U.S. Public Health Service estimates that more than eight million people have already sustained some degree of hearing impairment resulting from noise. There is also some evidence that hearing loss often associated with the natural process of getting older would not occur if our industrial society was substantially quieter.

The 1971 EPA report further stated that "noise can interfere with speech communication and the perception of other auditory signals, disturb sleep and relaxation, be a source of annoyance, interfere with an individual's ability to perform complicated tasks, influence mood, and otherwise detract from the quality of life." Additional evidence of physiological and psychological changes are cited in medical journals. These changes range from increased blood pressure and cholesterol levels to elevated heartbeat, respiration, and muscle tension. Such stress can contribute to erratic physical performance and eventually impair mental acuity.

During 1971 and 1972, the Orange County Health Department conducted numerous case studies, some related to the harmful effects of noise. Criteria resulting from these case studies are shown in Table 1.

Table 1

HARMFUL EFFECTS ON HUMANS

Harmful Effect	Noise Ranges in Decibels at Which Harmful Effects Begin to Occur
Hearing loss	75-85
Extra auditory physiological effects	65-75
Speech interference	50-60
Interruption of sleep	35-45

Maximum suggested non-occupational exposure to noise at the upper limits shown in Table 1 is contained in another 1971 EPA report entitled "Fundamentals of Noise." To provide protection of essentially all persons, the report recommends no more than 16 hours exposure daily to 70 decibels. Noise levels may be increased by 5 decibels for each halving of the time exposure per day without increasing the hazard of hearing impairment.

While the foregoing data does not apply directly to the City of Sacramento, it does apply to an area of California which is also urbanized. The first three physiological effects can occur as the result of human activity in any land use category of a city and the last effect-interruption of sleep — primarily occurs in residential areas. These noise ranges and their associated land use/human activity therefore have relevance in establishing healthy as well as realistic and acceptable land use compatibility standards for the City of Sacramento.

Unconstrained noise can also result in unnecessary expenses to the community-at-large and to its affected residents and users. Often times noise which is not controlled at its source results in costly insulation of structures, deflective barriers, or other noise attenuation measures along the sound path. Long term noise problems associated with many airports and closeby freeways can induce depressed land values, sluggish property sales and secondary expenses such as increased police or fire protection services because of a higher vacancy rate and vandalism. While these conditions are not typical of the Sacramento community, they could become so if noise is permitted to go unchecked. It is also possible that the economic viability of an urban center like Sacramento could suffer, in part, due to the fact that quieter places to work and live could be found in the less urbanized and therefore quieter areas away from the City.

Description and Measurement of Noise. The description and measurement of noise is subject to a set of problems all its own. Some combinations sound pleasant, others are dissonant and irritating. The fact that sounds are a complex mixture of tones and overtones varying in volume, pitch and duration have led to many concepts and mathematical techniques related to their description and quantification as an annoyance factor. Certain sounds, however, are almost universally accepted as being annoying.

Once a sound is procuded however, regardless of type of source, it travels to its receiver. The path it takes can also have a substantial effect on its quality, and how and where it is received. This is an important consideration in understanding some of the noise mitigating measures presently available where noise cannot be technologically or economically controlled at the source itself. For example, among other characteristics, sound travels at different speeds in air, water, metal, and other media; and can be focused, reflected, or dampened by intervening structures or barriers.

When sound reaches the human ear, it responds in a non-linear fashion. At low volume, the ear is more sensitive to middle frequencies than to high or low frequencies in the audio spectrum. This phenonmenon diminishes as volume increases. The response of the ear to volume changes is more or less logarithmic, i.e. sound containing twice the energy of another sound will be perceived as only slightly louder.

All of these variables obviously make it difficult to describe a sound, let alone measure it and compare it with other sound in consistent terms. One of the most successful and widely used systems to describe sound is based on the unit called the "bel." Bels are expressed on a logarithmic scale so that they correlate closely with the non-linear volume characteristic of the human ear. Since the bel is too large in quantity for convenient use, it is further broken down into a unit called the decibel (dB) which is one-tenth as large. A weighing factor is often applied to the decibel scale to compensate for reduced human sensitivity to high and low audio frequencies. The set of weighting characteristics most commonly used is called the A-scale, and sounds expressed in decibels weighed by the A-scale are abbreviated dBA.

Even with a scale to describe individual sounds, a description of "noise" is difficult. An accurate noise measurement would have to take into account loudness, pitch, duration, frequency, the number of noise events, the time of occurrence, whether the sound was sustained or sudden or repeated, and so forth. No such comprehensive measure has yet been developed. There are, however, several different systems in use, some of which are described in the appendices. Noise contour maps supplied by other agencies utilize those different systems, and they are generally not interchangeable, although approximate conversions may be made in some instances.

All of the noise source data, and proposed standards, along with the various transportation noise contours are expressed in decibels (dB), utilizing the Day-Night Equivalent Sound Level (Ldn) rating scale. The Ldn is a noise measurement based on human reaction to the cumulative exposure to noise over a 24-hour period. It takes into account the greater annoyance value of nighttime noises. This method is recommended by the Environmental Protection Agency and the State Office of Noise Control for use in describing the cumulative effect of exposure to all sources of environmental noise, and is based on the A-weighted scale of sound measurement. A more thorough description of Ldn is found in Appendices A and B.

The State Department of Transportation furnished the City of Sacramento with a set of existing and projected L10 noise contours for freeways and highways in the City. Briefly, the L10 method measures a noise level which is exceeded ten (10) percent of the time. However, in order to ensure that all noise data in this Element are consistent, the Planning Department modified Caltrans' maps through predetermined mathematical calculations by subtracting 3 decibels from L10 values to get an equivalent Ldn level. Thus, L10 and Ldn values are indicated on the maps because ongoing projects necessitate L10 values until unilateral conversons are provided by various governmental jurisdictions.

NOISE IN SACRAMENTO

Noise in Sacramento is best described on two generalized levels; first, the ambient or background level which is an accumulation of all sounds from many sources near to and from the observer without individual sources being singled out; and secondly, another level which describes noise from a specific type of source.

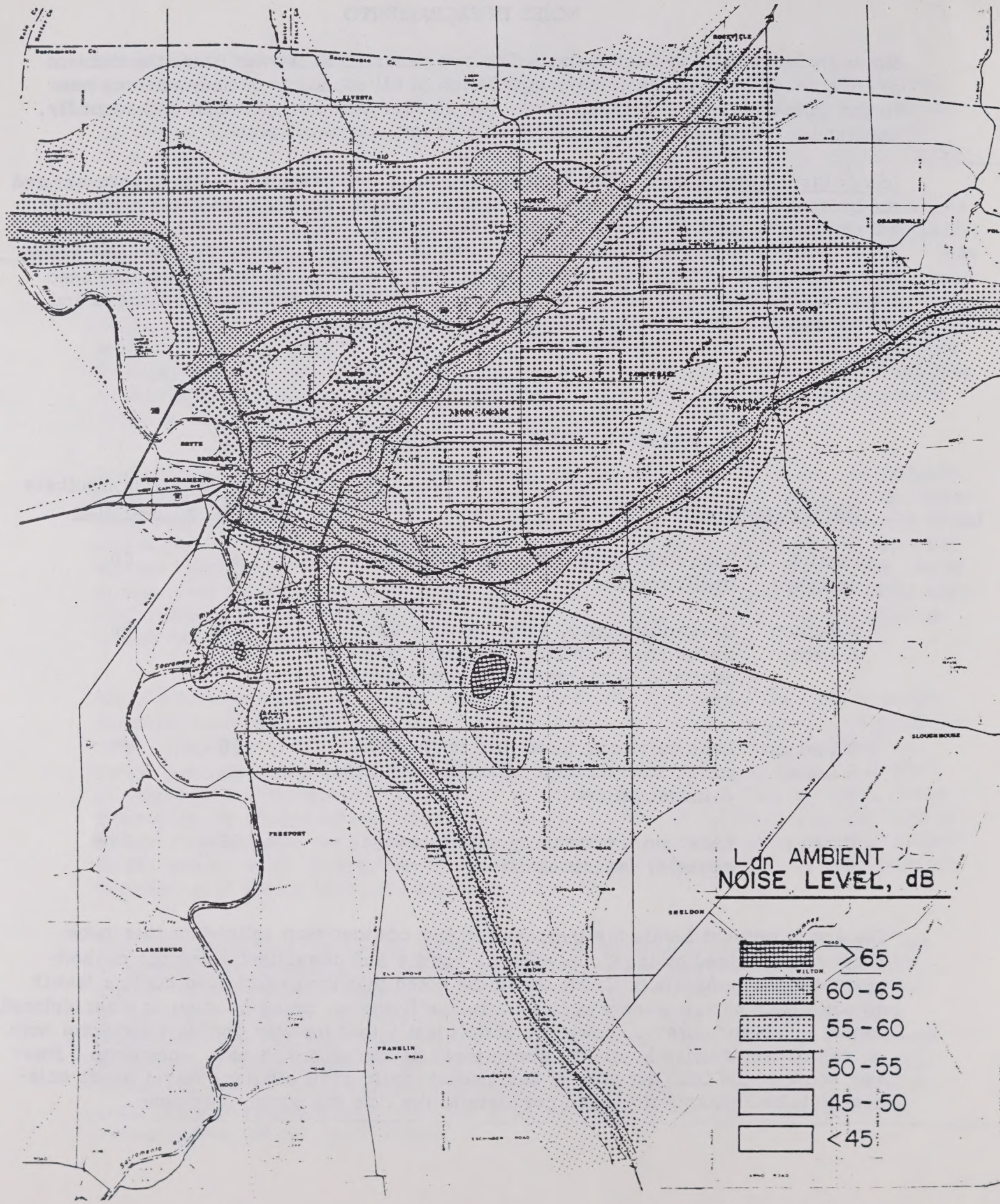
Ldn Ambient Noise Levels. The Sacramento County Environmental Health Department and the independent acoustical engineering firm of Wilson, Ihrig & Associates conducted a County-wide study and survey of noise during 1973. Within the City portion alone, 102 sites determined by a grid distribution pattern were surveyed, each site being measured numerous times over daily and monthly periods. These surveys disclosed the following typical ambient or background noise levels associated with urban and suburban,industrial, commercial, and residential areas:

Table 2

Ldn AMBIENT NOISE LEVELS, SACRAMENTO COUNTY

Generalized Areas		Ldn Noise Levels in Decibels Nighttime	Daytime
Rural & suburban	Very quiet community, far from main traffic routes	40	50
Suburban & Urban	Quiet community, some nearby main traffic routes and higher density residential & semi-residential/commercial use	50	60
Suburban & urban	Less quiet community near main traffic route, intersections, limited commercial & industrial use	60	65
Urban	Least quiet community near freeways, airports, industrial use	65+	70+

The above ambient levels are indicated on the contour map following this page. They were prepared by the County Health Agency and consultant using the methodology defined in Appendix C. It should be noted that the generalized contour levels do not reflect certain events such as airplane flyovers, trains passing or other isolated events. The contours do, however, show clearly that freeway corridors generate more or less constant noise levels far above those of surrounding areas. Interstate 5 freeway south of the Old City area of Sacramento would show similar contour bands adjacent to it had construction been complete at the time the survey was done.



CONSTANT A-WEIGHTED NOISE LEVELS IN SACRAMENTO COUNTY IN MAY AND JUNE, 1973

Specific Sources of Noise. Significant sources of noise affecting the City of Sacramento are automobiles, aircraft, railroads, powered gardening equipment, stereo sound amplifiers, musical instruments, power tools, air conditioners and compressors, and construction activities. Sound levels resulting from these and other common sources are shown in Table 3 supplied by Sacramento County.

Table 3

EXAMPLES OF SOUND
LEVELS FROM COMMON SOURCES

	Decibel Level	Recommended Maximum Levels	Indoor Noise	Outdoor Noise
Uncomfortably Loud Painful	130			
	120	Short term		
		-Industrial Noise		
	110		-Rock Music Band	-Jet Takeoff at 1000'
	100			Jet Flyover at 1000'
				Motorcycle at 50'
Very Loud	90	-Eight Hour		-Compressor at 50'
		Industrial Noise	-Food Blender at 3'	Power Mower at 3'
	80		-Garbage Disposal at 3'	Diesel Truck at 50'
			-Shouting at 3'	-Average Traffic on
	70			Street Corner
Moderately Loud			-Conversational Speech	-Power Mower at 100'
	60			-Air Conditioner at
		-Res. Prop. Line*(Day)	-Typical Business Office	50'
	50	-Res. Prop. Line*(Night)		
Quiet		-Res. Int.** (Nighttime)		-Quiet Urban Daytime
	40			
				-Quiet Urban Nighttime
	30			-Quiet Suburban Nighttime
				-Quiet Rural Nighttime
Very Quiet	20			
	10			
			-Whisper at 5'	-Leaves rustling
	0			

* Residential Property Line
** Residential Interior

Source: Draft Environmental Impact Report for Sacramento County Lone Star Use Permit, December 18, 1974.

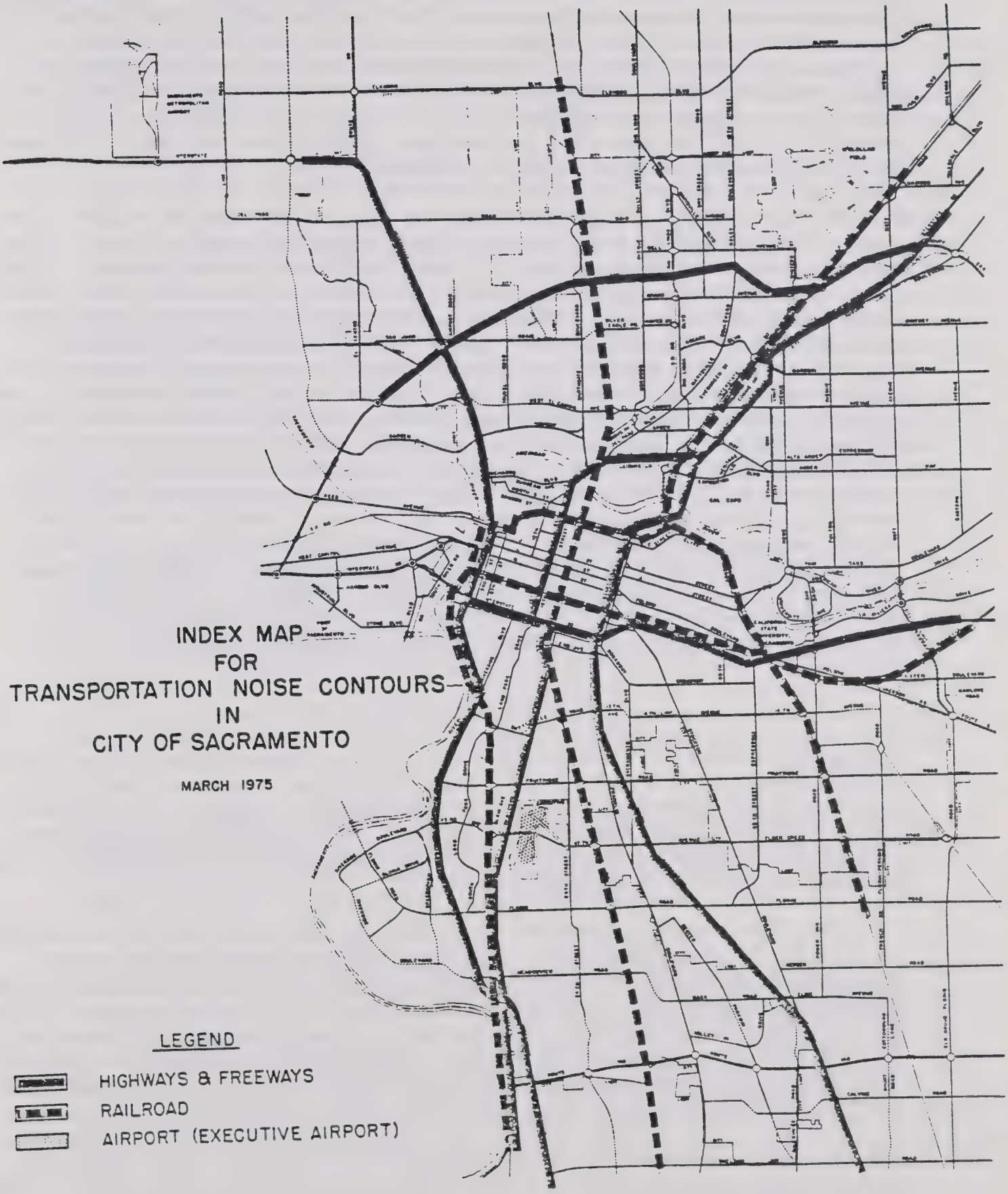
Domestic Noise Sources. The routine non-transportation activities of people also add greatly to noise pollution within Sacramento. Such fixed noise sources such as power mowers, hedge trimmers, chain saws, and construction activities produce excessive noise levels between 60 and 75 decibels. Examples of some of the fixed and mobile noise sources and levels surveyed in Sacramento County are shown in Appendix D. Surveys conducted for the Sacramento County Health Agency by the Sacramento City Police Department and the Sacramento County Sheriff's Department reveal that the majority of noise complaints called in by citizens concern barking dogs or loud parties. Clearly, these sources do not generate the most noise, but at the present time generate the most complaints.

Construction equipment can generate considerable noise, particularly on large public, commercial, or industrial projects. The argument is frequently made that noise from construction is temporary. This may be true for any one project, but in major commercial areas construction is an ongoing condition. Other non-residential noise sources are car washes and compressors; and sand and gravel extraction operations in industrial areas. Maintenance operations involving tree trimming shredders and water pumping equipment are often a significant source of noise during fall and winter seasons.

Transportation Noise Sources. Noise from transportation sources is the largest single category of excessive levels in Sacramento. The map on the following page identifies those transportation corridors and facilities for which noise contour data has been collected. Precised maps on these sources are available for review by the public through the Sacramento City Planning Department with the exception of the projected Ldn contours for Executive Airport which is shown as Appendix E. These contours were furnished by Sacramento Regional Area Planning Commission, and are slightly modified by the City Planning Department to make CNEL consistent with Ldn since these two are very similar in value. Caution should be taken, however, not to overemphasize noise contours since they are merely tools to aid in analyzing a very complex phenomenon.

Diesel trucks on the freeways frequently exceed 80 dB at the edge of the right-of-way. Automobiles at freeway speeds are not quite as loud but can easily attain 75 dB. Motorcycles with poorly designed mufflers can exceed the noise output of either cars or trucks. The 1974 L10 (Ldn) data indicate that the 65 dB level extends outward into some areas of the community from the freeways and highways anywhere from 200 to 1600 feet. The 1995 projected contours indicate an even greater noise problem. Less intrusion is evident along sections that have sound barriers or which are either depressed or elevated. Furthermore, where there are on-ramps, the levels are higher because of vehicular acceleration.

Air transportation constitutes the largest single noise problem for many communities, particularly with large jet aircraft flying overhead. Fortunately, the City of Sacramento is in a better location than much of the development outside because of existing flight patterns. Both Natomas and Jensen airports have minimal noise pollution since their aircraft are mainly limited to agricultural activities. According to the County Department of Airports, the existing activity is insufficient to cause serious noise



INDEX MAP FOR TRANSPORTATION NOISE CONTOURS IN CITY OF SACRAMENTO

MARCH 1975

LEGEND

- HIGHWAYS & FREEWAYS
- RAILROAD
- AIRPORT (EXECUTIVE AIRPORT)

problems. Executive Airport on the otherhand is the major general aviation facility in the greater Sacramento area and serves a small number of jet aircraft and helicopters, both of which are particularly noisy. The 1995 projected Ldn 65 dB contour line extends several blocks into residential areas on the northeast and a few blocks into areas on the southeast. The new Master Plan for Executive Airport will address this subject more thoroughly when it is prepared later this year; and the Airport Land Use Commission will be developing building standards for all new construction within the projected 65 dB contour lines.

Railroad trains operating at moderate speed on relatively level track produce noise levels approximately the same as those of a diesel truck at freeway speeds. Duration, however, of exposure to a train is somewhat different from exposure to a single truck. Equally obvious, the average person encounters far fewer trains than trucks in the course of a normal day. The frequency distribution of train-generated noise tends to be concentrated in the lower ranges, however, while these noises are harder to control they are also found somewhat less objectionable by most people. Yard operations on the otherhand are very different from line operations. While line operations produce the usual rumble and clickety-clack that most people are familiar with and expect, yard operations are generally carried on at a much lower rate of speed and produce sounds that have much greater potential for annoyance. Yard operations from Southern Pacific Railroad in the northwest section of the Old City are mostly surrounded by non-residential uses. Western Pacific Railroad's yard facility between the Riverside-Land Park and Oak Park communities has residential development adjoining it which has in the recent past generated noise complaints resulting in requests for mitigation by appropriate jurisdictions. Line operations along both companies trackage produce noise level contours of Ldn 65 dB which extend anywhere from 500 to 1500 feet into many sections of Sacramento.

NOISE CONTROLS

Alternatives. Most of the noise control alternatives involve the application of one or more of three preventive measures. These are (1) reduction at the source, (2) increased distance between the source and the human receiver, and (3) the provision of sound barriers and/or insulation. Attempts to control noise at the present time utilize all three approaches. The most effective but often the most difficult to achieve, however, is reduction of noise at the source.

The City of Sacramento is preempted from regulating most transportation noise sources by State and Federal jurisdictions. Interstate commerce provisions and statutes passed by Congress and the California legislature effectively preclude the City from regulating freeways, railroads and airports. While quiet trains and airplanes do not presently exist, some relatively quiet trucks and motorcycles have been produced. The City and other local jurisdictions should support State and Federal authorities in their actions to require quieter exhaust systems on all motor vehicles. Tread design modifications should also be encouraged which reduce undesirable tire noise.

The City can control certain aspects of transportation noise directly but less efficiently than at the source itself. Noise emanating from aircraft on the ground can be and is controlled to some extent by the locations designated for engine testing and by

deflectors or other muffling devices such as adjacent park or open space areas at the end of runways. These devices, however, do nothing to correct noise from overflying aircraft. In the case of railroad noise, noise emanating from yard or line operations can be reduced somewhat by erecting barriers along the rights-of-way wherever feasible and warranted. This has greatest potential in newly developing areas where this requirement should be made part of a subdivision map approval.

The City should also use this method of interrupting the transmission path of noise generated along freeways or other major highways. Masonry walls or other suitable barriers of appropriate opaqueness and height adjacent to freeways for example have the effect of reducing noise by between 5 and 15 decibels. The location and design of streets themselves should also reduce noise somewhat. Major streets in newly developing or projected growth areas should continue to be designed in such a way as to service neighborhoods and yet not penetrate them. Proper arterial signalization can often directly reduce traffic noise as well; and landscaping, if properly planned, has an indirect psychological effect of reducing the impact of noise. Planning for new commercial and industrial uses which generate high volumes of truck traffic should emphasize the advantages of direct access to major streets that are removed from residential areas of the City. Enforcement of nuisance laws related to noisy mufflers or operation of some vehicles in non-designated areas can and do provide further positive benefits to the community-at-large.

Nearly all fixed mechanical or construction equipment can be made quieter. Some equipment needs nothing more than better muffling devices. Walls around certain types of sources such as air conditioner and compressor units should also be utilized. Both pile drivers and jackhammer compressors used in construction work now have modifications which reduce the noise level and at the same time accomplish the work without adverse effects. One control alternative for mitigating these and other construction source noises is to set and enforce measurable standards for construction projects, equipment purchase contacts, and other contracts let by the City.

Another large area of noise control affects domestic noises related more closely with residential area. Air conditioners, loud music, swimming pool pumps and other noise sources should be effectively regulated by ordinance. Enforcement of such an ordinance is an important consideration obviously.

Finally, insulation of the receiver can substantially reduce the noise level. Workers in extremely noisy environments should or are required to wear protective equipment, especially around industrial noise sources. Homes and offices should be constructed in such a manner as to reduce outside noise. A typical dwelling unit reduces the noise level being transmitted from outside the structure by about 20 decibels. Additional insulation can increase this level of reduction by as much as 40 decibels. The additional construction costs may be warranted in some particularly noise sensitive areas such as residential units adjacent to freeways or nuisance producing industrial uses.

NOISE LEVEL POLICY STANDARDS

Numerous studies of human reaction to noise and its correlation with certain activities and land uses have led to a variety of empirical noise standards. These standards vary with the objective desired; e.g. criteria for a community can be predicated on the injurious effects of noise, or based upon the level at which complaints become too frequent. Practical considerations also dictate that standards should be set at levels which can be effectively and efficiently administered, which are acceptable to the community-at-large, and which do not produce excessive costs which are passed on to the resident or user of the community. Whatever the standards finally selected by the community, it is implied that appropriate measures will then be taken to enforce them.

Present levels of ambient noise in this community, as previously discussed, are in some cases too high and should be reduced if possible. It is believed that the City of Sacramento should establish noise level policy standards based on certain criteria. The first criterion is that the detrimental effects of noise, as also previously discussed, should be considered in setting this community's standards. It should also be a criterion that noise level standards should be pervasive in the sense that these cover the entire City and follow the general relationships of noise to land use and human activity, i.e. residential levels should be lower than commercial levels, and commercial levels should be lower than industrial levels. Finally, and perhaps most importantly, it is believed that the noise level policy standards set by the City of Sacramento should be applicable for the 1975-1980 period. They should also be reviewed annually and revised each time the General Plan for Sacramento is updated.

Existing Standards. Some noise level standards in the form of adopted regulations are presently in existence. The most relevant of these pertain to construction of structures and their placement for financing purposes. Article 4 of the California Administrative Code, Title 25, Chapter 1, Subchapter 1, sets forth provisions establishing noise insulation performance standards for new hotels, motels, apartment houses and dwellings other than detached single-family dwellings. Prescribed interior noise levels in noise critical areas shall not exceed a peak level of 45 decibels slow response in sleeping rooms and 55 decibels slow response for other habitable rooms. Residential structures located near airports and within annual CNEL contours of 60 decibels (CNEL and Ldn values are very similar) require an acoustical analysis showing that the structure has been designed to limit intruding noise to the foregoing prescribed allowable levels once the noise element of a general plan is adopted by a jurisdiction. Residential structures located within a noise contour of 65 decibels or greater, or when not available, within 1000 feet of an existing or adopted freeway, expressway, parkway, major street or through street or within 3000 feet of a railroad require an acoustical analysis showing that the structure has been designed to limit intruding noise to the preceeding interior noise levels also. The same conditions apply to residential structures within 1000 feet of an industrial zone boundary.

FHA loan applications administered by the Department of Housing and Urban Development are also reviewed against interim noise standards which have been in existence since 1971. Under these standards new and rehabilitated residential construction is financed based on specified exterior and interior noise levels. Along freeway corridors in Sacramento, this generally has the effect of requiring barriers between

the property in question and the freeway.

Land Use Sensitivity. There is a close relationship between land use and the level of noise which is tolerable. Residential neighborhoods are expected to be quieter than industrial areas. Some land uses are relatively unaffected by noise, while others are greatly affected. The various land uses can be divided into three categories according to noise sensitivity.

> Insensitive Land Uses--The noise level does not detrimentally affect the operation of a particular activity. A wide variety of uses can be placed in this category including some non-urban uses, transportation systems, and wholesaling/manufacturing uses.
>
> Moderately Sensitive Land Uses--Some degree of noise control must be present if these activities are to be successfully carried out. Included here are mostly medium intensity urban land uses.
>
> Sensitive Uses--Lack of noise control will result in many of the effects described earlier in this element. This category primarily contains urban land uses that are associated with non-working activity and places where quietness is essential.

A successful noise abatement program requires that standards be established which are easy to interpret and relatively easy to measure with available equipment. Furthermore, these standards should closely relate major land use activities with uses that fall under the three sensitivity categories described above. Examples of various land uses in each noise sensitivity category are as follows:

Table 4

LAND USE SENSITIVITY

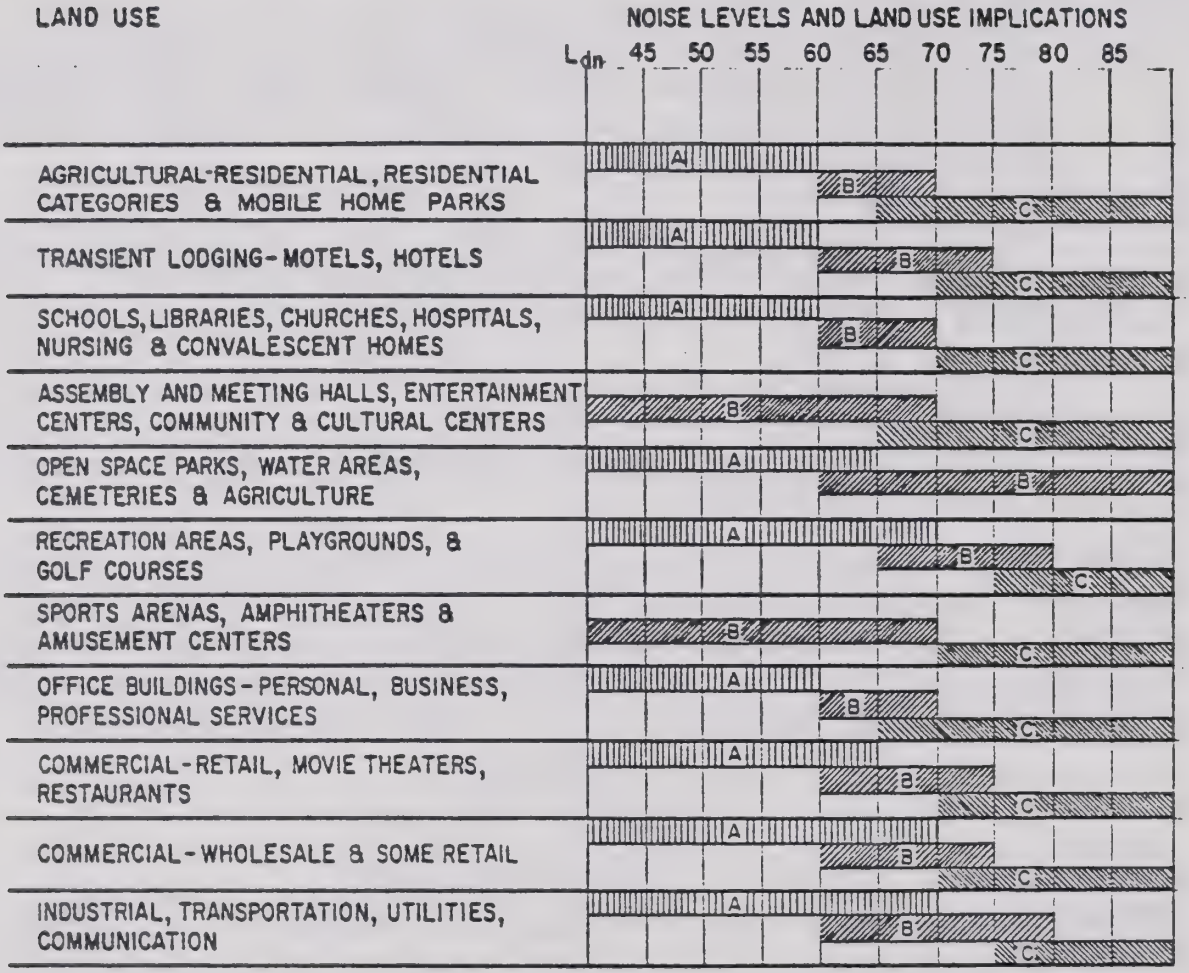
Insensitive	Moderately Sensitive	Sensitive
Horticultural, grazing lands	Assembly, meeting halls	Single-family residences
Wrecking, salvage yards	Community centers	Apartments
Manufacturing plants	Theaters	Mobile home parks
Transportation terminals	Cemeteries	Motels, hotels
Outdoor amusement facilities	Water areas	Schools
Mineral extraction and processing plants	Retail stores and service facilities	Libraries
Utility, communication facilities, substations and yards	Open space parkstrips	Churches
Undeveloped land	Neighborhood parks	Hospitals
Wholesaling and warehousing facilities	Sports arenas	Nursing, convalescent homes
	Amphitheaters	
	Office buildings	

The above listings indicate only the sensitivity of the use to noise, not how noise emitted from the use itself affects surrounding uses. It is also important to reiterate that the above land uses are illustrative and generalized examples only and are not intended to be for application in specific project evaluations that may be considered before the City Planning Commission or City Council.

Land Use Compatibility Standards. The following Land Use Compatibility Chart for Community Noise establishes desired ranges of L_{dn} levels for Sacramento within the 1975 - 1980 period:

Table 5

LAND USE COMPATIBILITY FOR COMMUNITY NOISE



A — SATISFACTORY; NO SPECIAL REQUIREMENTS.

B — USE SHOULD BE PERMITTED ONLY AFTER CAREFUL STUDY & INCLUSION OF PROTECTIVE MEASURES IF NEEDED.

C — USE SHOULD BE DISCOURAGED. IF PERMITTED, NOISE REDUCTION MEASURES MUST BE TAKEN.

NOTE: NOISE INSULATION FEATURES FOR NEW CONSTRUCTION SHOULD BE SUCH THAT AN INTERIOR L_{dn} OF 45 dB WILL BE ACHIEVED IN AREAS WHERE PEOPLE SLEEP.

Table 5 should be approached as a tool to evaluate the impact primarily of noise levels from the surrounding uses on a proposed use. Other tools exist to help evaluate impacts of proposed uses on the surroundings. Nonetheless, a proposed use which clearly generates noise louder than the "A" levels in Table 5 certainly would suggest a need for careful review.

Freeway Noise Standards. When any boundary line of a proposed subdivision or property where entitlement to use is requested abutsupon a freeway or designated freeway route, the California Department of Transportation's predicted 1995 L10 noise levels shall be compared with the design noise levels presented in Table 6 of this policy.

If the predicted 1995 L_{10} noise level at a line located fifteen feet (15') from and parallel to the subdivision/freeway boundary exceeds the noise standard specified in Table 6 for the intended land use category, then a suitable sound attenuation barrier shall be constructed along the boundary line of the freeway or designated freeway route.

A suitable barrier wall shall be concrete, masonry or other material, approved by the City Engineer, having a minimum surface weight of 3.5 pounds per square foot. Said wall shall be structurally stable in accordance with Section 2302 of the Uniform Building Code, and shall be aesthetically pleasing and be of sufficient durability to have a minimum 40 year service life. The height of a suitable barrier shall be that height, as determined by U.S. Department of Transportation's Barrier Nomograph Form No. 53120, required to reduce the predicted 1995 L_{10} noise level, as described above, to the design level specified in Table 6, but in no case will it be required to be higher than twelve feet (12') from the ground surface to the top of the wall. Earth mounds constructed in a manner approved by the City Engineer will also be considered suitable sound attenuation barriers. A combination of earth mound and barrier wall will be suitable provided both components meet all the requirements of this policy.

Table 6

DESIGN NOISE LEVEL/LAND USE RELATIONSHIPS
FOR MITIGATING FREEWAY NOISE

Land Use Category	Design Noise Level -L10	Description of Land Use Category
A	60 dBA (Exterior)	Tracts of lands in which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. Such areas could include amphitheaters, particular parks or portions of parks, or open spaces which are dedicated or recognized by appropriate local officials for activities requiring special qualities of serenity and quiet.
B	70 dBA (Exterior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sports areas, and parks.
C	75 dBA (Exterior)	Developed lands, properties or activities not included in categories A and B above.

The above freeway noise standards shall not be applicable where the expressed design levels in Table 6 can be obtained at the closest building wall oriented towards the freeway right-of-way line.

The foregoing freeway noise standards shall take precedence over those exterior levels expressed in Table 5 wherever proposed projects are primarily affected by freeway noise.

No specific noise mitigation standards are proposed for noise sensitive land uses abutting railroads since the frequency and nature of line activities as well as the trackage design features do not lend themselves to uniform standards. Standards for each situation will be evaluated on an individual basis.

OTHER POLICIES

Noise Abatement Policies. The following noise abatement policies are recommended for adoption in addition to the noise level policy standards set forth above:

1 - Give high priority to the preparation and adoption of a comprehensive noise ordinance. Said ordinance should be coordinated with the County of Sacramento, and implemented by the appropriate agency on a County-wide basis.

2 - Continue to request and support stronger State and Federal legislation to require reduced noise generation from sources under those jurisdictions. Progress should be reviewed annually by the City Council working jointly with the County's Board of Supervisors.

3 - Report annually to the City Council on progress being made in lowering noise levels in the City to those noise level standards setforth in this Element for the 1975-1980 period. Said annual reports should include recommendations for further measures as laws and technology permit.

4 - Review and update the Noise Element thoroughly and comprehensively every five to seven years as part of the General Plan update process.

5 - Continue to periodically review and update subdivision and zoning regulations which encourage the reduction of noise through better site design and building location.

6 - Set and enforce measurable standards for noise reduction and control on construction projects, equipment purchase contracts, and other related contracts let by the City. The County Health Agency and the City Engineering Department should cooperate in implementing this policy.

7 - Continue to enforce nuisance laws and the California Vehicle Code related to the control of noisy mufflers and the operation of off-road vehicles.

8 - Support and lend assistance as needed to the County Department of Airports in its effort to update the Executive Airport Master Plan, particularly as the Plan relates to noise attenuation measures and the noise impact on surrounding land uses.

9 - Give consideration to new major streets in developing areas of the City as part of the community plan update process, and locate and design them consistent with appropriate community planning principles in such a manner as to service but not disrupt noise sensitive land use areas.

10 - Give consideration to the location and design of proposed land uses abutting transportation facilities in newly developing areas of the City as part of the community plan update process by specifying needed noise mitigation measures for specific areas and placing less noise sensitive uses next to the transportation source wherever appropriate from a community planning standpoint.

11 - Request that the California Department of Transportation give priority and financial allocation to the construction of noise attenuation barriers in noise sensitive areas abutting freeways within the City which were developed or under development prior to or concurrent with freeway construction .

12 - Require as a condition of subdivision map approval that all new development on properties abutting railroads or freeways provide suitable sound attenuation barriers to reduce intruding noise to the applicable exterior noise level standards of this Element.

13 - Review proposed development projects affected by railroad generated noise on on individual basis, and require appropriate noise barriers wherever feasible.

14 - Give consideration to the noise producing aspects of a non-residential development that is being proposed adjacent to a residential area, and require appropriate noise mitigation measures as a condition to approval of entitlement to use.

ADDENDA TO GENERAL PLAN ENVIRONMENTAL IMPACT REPORT

The following addenda to the General Plan Environmental Impact Report are a result of the completion of the Noise Element of the General Plan. When adopted, these sections will be added to the Final EIR.

I. Description of Project, Environmental Setting & Impacts

The text of the General Plan for Sacramento, California (Section 1 and Section 12 - EIR) adequately describes the location, purpose and scope of the Noise Element with the exception of the following statements: This section is designed to serve as the environmental impact report for Section 9, Noise Element of the General Plan for Sacramento, California. It, with Section 12, fulfills the requirements of the California Environmental Quality Act, and is subject to the normal review procedure for an Environmental Impact Report.

II. Aesthetic and Nuisance Conditions

Aesthetic and nuisance conditions in Sacramento are specifically discussed in the Noise Element, pages 5 through 11.

Impact

From an environmental standpoint, the Noise Element is believed to have a beneficial impact upon the Sacramento community since specific mitigation measures to reduce noise are setforth in the standards and policies sections, pages 12 through 17.

Potential nuisance conditions can be anticipated from increased usage of transportation sources and other sources as discussed in the Noise Element on pages 5 through 11. However, appropriate mitigation measures for its reduction are recommended in the policies on pages 16 and 17.

III. Analysis of Impacts and their Disposition

A. Mitigation Measures Proposed to Minimize the Project

The Noise Element of the General Plan is an amalgam of mitigation measures to avoid the detrimental effects of increased transportation noise and other noise sources. As such, they introduce a number of potentially beneficial impacts of their own. These are discussed throughout the Element.

1. The Noise Element proposes a series of policies intended to reduce noise levels. It establishes a set of noise standards for Sacramento land use districts categories to encourage an improvement in quality of the environment.

2. The Noise Element encourages control of land uses abutting transportation noise sources. It encourages subdivision and zoning regulations to be modified to provide for proper site design and building location where noise sensitive uses are located adjacent or close to transportation sources, and to separate noise sensitive land uses from proximity to traffic sources.

3. The Noise Element will indirectly affect energy conservation measures to varying degrees where modification of mechanical noise sources themselves are recommended; and will indirectly be beneficially affected by increased structural insulation standards now required by AB 1575.

B. Alternatives to Project

1. No Project:

This alternative is infeasible in that the subject Noise Element is mandated by State law as set forth in California Government Code Section 65302(g). In the event that the City Council could choose a no action alternative, the effect would be the continuation and possible increase of ambient and specific source noise levels in Sacramento as described on pages 5 through 11 of the Noise Element. Thus, no project would have an adverse impact upon the environment in the City of Sacramento.

2. Reduced or modified project:

A reduced project could propose less stringent noise level standards and policies for the City of Sacramento; a modified project could propose more or less stringent noise standards and policies.

The impact of more stringent noise level standards and policies than proposed for the City of Sacramento would probably:

a) further decrease the number of humans experiencing hearing loss;

b) further decrease the number of humans experiencing extra-auditory physiological effects;

c) further decrease the number of humans experiencing speech interference;

d) further decrease the number of humans experiencing the interruption of sleep;

e) further increase the cost to developers and builders of erecting noise barriers and insulating structures, this cost in turn being passed on to the consumer;

f) further increase the cost of governmental services by requiring additional staff to refine initial programs and enforce other programs in the implementation sections.

The impact of less stringent noise level standards and policies than those proposed for the City of Sacramento would probably:

a) provide only limited or insignificant change in the physiological and psychological negative effects previously mentioned above.

b) reduce slightly the additional costs of governmental services required to implement the proposed policies.

c) reduce slightly the additional costs ultimately borne by the consumer in providing new development where necessary with less stringent or no noise barrier and/or structure insulation.

d) continue to create less economically stable areas adjacent to high impact noise sources, thus perpetuating high vacancy rates and vandalism.

e) continue to sustain the frequency of noise complaints from non-domestic sources.

C. Adverse Impacts Which Cannot be Avoided if the Project is Implemented

1. Increased cost to the City of Sacramento for implementation and enforcement of proposed noise standards and policies.

2. Increased cost to developers to construct noise barriers; increased cost to builders to install noise insulating materials.

3. Increased cost to home buyers as well as commercial and industrial occupants due to increased cost of construction.

4. Minor disruption of vegetative and wildlife environment where exterior noise barriers are required.

D. Relationship Between Local Short-Term Uses of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Implementation of the proposed Noise Element is required at this time by State mandate. The reduction of noise by means of the expressed standards and policies will protect the urban environment for present and future residents. Long-term productivity for man and his urban land uses will be increased because of the reduction of harmful and distracting noise, and the more uniform distribution of noise-free neighborhoods and communities. This should have the long-term effect of stabilizing property values as well. On a much narrower scale, however, implementation of the Element will improve the living environment but may disrupt the economic status quo of the construction industry and buyer/user habits as these relate to noise generating consumer products. The present mandated Element and its attendent policies which call for many short-term changes in the environment and economy must be weighed against the long-term advantages of a relatively noise-free city.

E. Irreversible Environmental Changes Which Would be Involved in the Proposed Action Should it be Implemented

The proposed action will require the increased use of non-renewable resources, however, will be indirectly offset by the increased structural insulation standards now required by AB 1575; and the use in some instances of increased structure setback requirements and landscaped berms.

F. Growth Inducing Impact

The Noise Element may tend to slow growth adjacent to freeways and other primary noise sources inasmuch as builders may choose to build elsewhere due to potential increased costs associated with noise attenuation measures. On the other hand, the Element may also act as an incremental attraction to presently noise-impacted areas of the City if there is a high enough demand for developable land that is relatively free of noise pollution.

IV. Public Policies, Laws and Regulations Related to the Project

In addition to those items listed in Chapter 12, the primary law related to the Noise Element is found in the regulations of the California Administrative Code, Article 5 of Chapter 3 of the California Government Code. Section 65302(g) requires that "a noise element in quantitative numerical terms, showing contours of present and projected noise levels..."

V. Organizations and Persons Consulted

Organizations, persons and documents consulted in the preparation of this EIR can be found in the bibliography of Noise Element.

This EIR was prepared by

Sacramento City Planning Commission
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APPENDIX A

DEFINITIONS

Acoustics - (1) The science of sound, including the generation, transmission, and effects of sound waves, both audible and inaudible. (2) The acoustics of an auditorium or of a room, the totality of those physical qualities (such as size, shape, amount of sound absorption, and amount of noise) which determine the audibility and perception of speech and music.

Ambient Noise or Sound - The level of noise or sound that is all-encompassing within a given environment, being usually a composite of background sounds from many sources near to and from the observer. No specific source is singled-out in the ambient level.

Community Noise Equivalent Level (CNEL) - The CNEL relates various A-weighted measurements (dBA) to the duration of the sound, the time of day during which it occurs, the total number of such events, and the probable community reaction. It is a combination of separate daytime, evening, and nighttime equivalent noise levels with weighting factors applied to evening and nighttime values. (Also see Appendix B.)

Contour of Noise or Sound - A line on passing through points where the same sound intensity level prevails. Contours form bands of varying widths emanating from a noise source.

dBA (Decibel A Scale) - The unit for measuring sound levels. Decibels are arrayed on a logarithemic scale so that while ten decibels is ten times more intense than one decibel, twenty decibels is one hundred times more intense, and one hundred decibels is ten billion times more intense than one decibel. Such a scale is needed because the human ear detects a wide range of acoustic energy. (A) scale is the sound measuring scale that most closely correlates with the loudness of sounds as perceived by the human ear. (Also see Appendix B.)

Frequency - The time rate of repetition of a periodic phenomenon. In sound, this time rate is known as cycles per second , or hertz.

Intensity of Sound or Noise - A measure of the loudness of sound or noise which is the rate of energy transmitted in a specific direction per unit area normal to that direction.

L_{dn} Noise - Similar to CNEL noise. (See Appendix B.)

L_{10} Noise - The statistical noise level given in terms of the value of the noise which is exceeded for ten percent of the time period during which the measurement was made. (Also see Appendix B.)

Noise - Any undesired or unwanted sound, usually of different frequency or intensity resulting in an objectionable or irritating sensation.

APPENDIX B

DESCRIPTION OF TYPES OF NOISE MEASUREMENT USED WITHIN NOISE ELEMENT FOR SACRAMENTO

Decibels (dB)

Decibel measurements were recorded on sound level meters placed in the field at strategic locations by the acoustical engineering firm of Wilson, Ihrig & Associates in order to determine both ambient and specific noise levels throughout Sacramento County.

"Decibel" abbreviated "dB", is a term having several definitions, all referring to a logarithmic ratio of two quantities. For our purposes in measuring sound, the definition is:

$$\text{SPL (Sound Pressure Level) in dB} = 10 \log \frac{P^2}{P_o^2}$$

$$= 20 \log \frac{P}{P_o}$$

where P = sound pressure in question

and P_o = reference sound pressure, by conventional .0002 microbars

The level chosen for P_o is generally considered to be the softest sound perceivable by a healthy young ear. The human ear can detect sounds with pressure level differences of magnitudes exceeding 10^{12}, so that the numbers would become very unwieldy unless logarithms were used.

The decibel notation provides a reasonable approximation of the response to sound intensity of the human ear, but must be modified to provide for the ear's frequency response characteristics. Many different modifications exist, but the most common, and one which does one of the best jobs at moderate sound levels, is the "A" weighting. A decibel reading on a meter using the "A" scale is abbreviated "dBA". This scale compensates fairly well for the lower sensitivity at high and low frequencies of the human ear. Unfortunately, decibels only take care of part of the sound description problem. All sounds obviously have duration as well as intensity, but the dB notation does not provide for this time distribution; however, a number of systems have been developed to remedy the situation.

Community Noise Equivalent Level (CNEL)

This is a rating technique currently used by the California State Department of Aeronautics for assessment of aircraft noise around the states major airports. The CNEL scale was developed as a scale which would include all important factors relative to community noise, yet be amendable to field measurement performed with a simple level meter.

The total noise exposure for a day is specified by the community noise equivalent level (CNEL) in dB, and may be expressed as:

$$CNEL = 10 \log \frac{1}{24} \left[\sum 10^{\frac{NL_D}{10}} + 3 \sum 10^{\frac{NL_E}{10}} + 10 \sum 10^{\frac{NL_N}{10}} \right]$$

Where: NL_D = weighted peak sound level for each daytime hour between 0700 to 1900

NL_E = weighted peak sound level for each evening hour between 1900 to 2200

NL_N = weighted peak sound level for each nighttime hour between 2200 to 0700

Day-Night Average Level (L_{dn})

A new composite noise scale is widely being recognized for specification of community noise from all sources, and is recommended by the U.S. Environmental Protection Agency and the State Office of Noise Control. It is called the Day-Night Average Level, and is nearly the same as CNEL except that the weighting for the evening time period in CNEL is eliminated and the "day" extends from essentially 0700 to 2200 while the "night," with a 10 dB weighting penalty, extends from 2200 to 0700.

The total noise exposure for a day is specified by the Day-Night Average Level (L_{dn}) in dB, and may be expressed as:

$$L_{dn} = 10 \log \frac{1}{24} \left[\sum 10^{\frac{NL_D}{10}} + 10 \sum 10^{\frac{NL_N}{10}} \right]$$

Where: NL_D = weighted peak sound level for each daytime hour between 0701 to 2200

NL_N = weighted peak sound level for each nighttime hour between 2201 to 0700

The L_{dn} noise contours for line operations of the Southern Pacific Railroad in the Sacramento area were developed by the Sacramento City Planning Department utilizing the following information furnished by S. P.:

1. Wyle Laboratories Report WCR 73-5, Assessment of Noise Environments Around Railroad Operation, July, 1973

2. The physical characteristics and grade level of all tracks in the City.

3. The number of train movements; various speeds of line operations, and average length of trains running through the City.

It should be noted that the L_{dn} noise contours for Southern Pacific Railroad Facilities do not reflect actual field circumstances, but based on information furnished, it can be assumed that these developed contour lines are fairly reasonable in reaching some planning decisions. It also should be noted that in a letter dated October 1, 1974, from Southern Pacific Transportation Company, it stated: "We do not anticipate any change in operations in the future that would result in increased noise levels in your area." (City of Sacramento)

Statistical Levels (L_y)

Any of the statistical noise levels is given in terms of the value of the noise level which is exceeded for a stated percentage of the time period during which the measurement was made. The symbol for the noise level which is exceeded y percent of the time is L_y.

The most common measures utilized are L_{99}, L_{90}, L_{50}, L_{10}, and L_1, which denote the value of the noise level which is exceeded 99, 90, 50, 10, and 1 percent of the time respectively.

APPENDIX C

METHODOLOGY USED IN PREPARING AMBIENT NOISE CONTOUR MAPS FOR SACRAMENTO

Following is an outline of the method used to prepare the ambient noise contour maps:

A. Preliminary Preparation

1. Before each measurement, check the battery condition of the sound meter. Replace battery - one size C alkaline battery for the GR 1565-A sound level meter - if necessary.

2. Frequent calibration should be made by using an acoustical calibrator.

3. Place the "windscreen" on the microphone for all the measurements.

B. Meter Reading Procedure

1. Set the sound level meter for the "slow" damping characteristics and to "A" weighting network for all readings, i.e. "A_S" on GR 1565-A sound level meter.

2. Observe the A-level reading for five (5) seconds and record the best estimate of central tendency and the range of the meter deflections.

3. Repeat the observations noted above until the number of central tendency readings equals or exceeds the total range (in decibels) of all the readings.

4. Find the arithmatic average of all the central tendency readings in (2) and (3) above, and call this estimate the community noise level for this particular time and location.

C. General Principles for Certain Unusual Situations

1. Measurements should <u>not</u> be made in weather conditions which may create a bias in the data. Examples of such weather conditions are:

   a. Wind in excess of 20 mph regardless of the windscreen used.

   b. Rain, sleet, snow or hail.

   c. Thunder.

   d. Wet streets or snow accumulations unless these conditions are typical for the community.

2. Measurements should <u>not</u> be made if significant changes in noise making activity or patterns occur during the sampling period. Examples of changes in noise making activities or patterns which affect the data are:

a. Nearby noise sources such as powermowers, pavement breakers, brush cutters or power saws.

b. Changes in vehicular traffic flow such as closed streets, detours, or shift-change periods near industrial plants.

c. Airline or other transportation strikes.

3. Measurements should <u>not</u> be made if the following conditions exist:

a. Vehicles entering, leaving or idling in a driveway and the measurement location is very close to the driveway.

The method described in this Appendix produces noise contours on an L_{50} basis (see Appendix A), thus, a contour labeled 55 dB on this basis would indicate that the ff dB noise level was exceeded along that contour half the time. The L_{50} measurement results from the "central tendency" meter reading described in Section B of this Appendix C.

The contours on the ambient noise map on page 6 are expressed in L_{dn} for consistency with the compatibility chart and various transportation maps. Conversion of L_{50} to L_{dn} typically requires an addition of 5 to 6 dB to the L_{50} level. The L_{dn} contours on the map were modified by adding 5 dB to all the previous L_{50} level.

This conversion results in a generalized noise contour map for determination of ambient noise over broad areas. Specific noise generators, such as busy intersections, will create localized "sensitive" areas of noise. These maps are generalized, and does provide an overall noise pattern for Sacramento County.

APPENDIX D

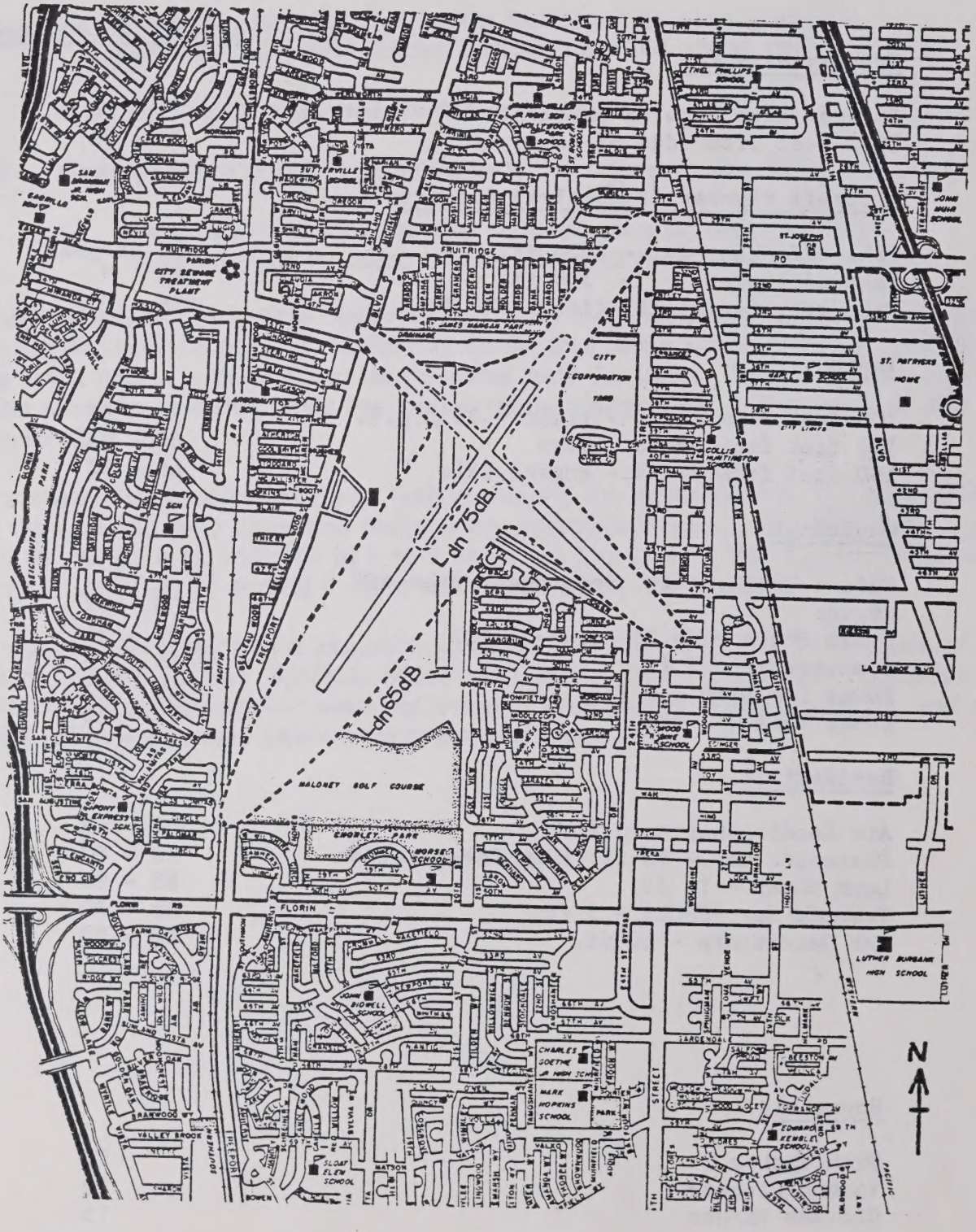
EXAMPLES OF NOISE LEVELS FROM COMMON URBAN AND SUBURBAN SOURCES
(Actual measurements in Sacramento County)

	Average Noise Levels dBA
Freeway - 99 N-S	
25 feet from dege of pavement	75 - 80
1000 feet from edge of pavement	65 - 70
Aircraft Flyover (Executive) Airport	
Take-off, Lear Jet - 1000 ft.	98 at peak
Take-off, prop - 500 ft.	85 "
Take-off, Cessna Citation - 500 ft.	86 "
Train	
100 feet from track - train - 35 m.p.h.	75 - 85
100 feet from track - horn	85 - 95
100 feet from track - engine idle	65 - 70
Municipal	
Refuse Truck, 3 ft. from power take off engine	88 - 92
Storm Drain Pump Station - 5 ft.	67 - 78
Compressors - 5 ft.	85 - 90
Power Low Blow - 5 ft.	90 - 95
Water Well - 5 ft.	70 - 80
Residential	
Air Conditioner - 10 ft.	55 - 65
Passenger Car - 50 ft. from intersection	75 - 80
Lawn Mower - 10 ft.	85 - 90
Transformer (SMUD) - 5 ft.	45 - 50
Gas Generators - 10 ft.	80 - 85

Household	
Dish Washer	78
Vacuum Cleaner	75
Clothes Washer	75
Freezer Compressor	55
Garbage Disposal	75
Kitchen Exhaust Fan	65
Hair Dryer	65
Food Blender	74

APPENDIX E

PROJECTED L_{dn} NOISE CONTOURS FOR EXECUTIVE AIRPORT



SOURCE: Sacramento Regional Area Planning Commission
Airport Land Use Commission
Policy Plan

July, 1974